EPA/ROD/R04-94/212
1994

EPA Superfund
Record of Decision:

FLORIDA STEEL CORP.
EPA ID: FLD050432251
OU 02
INDIANTOWN, FL
03/30/1994

RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Florida Steel Corporation
Indiantown, Martin County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Site noted above. The remedy was chosen in accordance with the Comprehensive Environmental Response. Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this Site.

The State of Florida, as represented by the Florida Department of Environmental Protection, has been the support agency during the Remedial Investigation (RI) and Feasibility Study (FS) process for Operable Unit Two (Groundwater and Wetlands) at this Site. FDEP, as the support agency, has provided input during this process in accordance with 40 CFR 300.430. Based on comments received from FDEP, it is anticipated that written concurrence will be forthcoming; however, a letter formally recommending concurrence has not yet been received.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This remedy addresses the contaminated groundwater and wetland sediment at the Site. The groundwater cleanup includes extraction of groundwater contaminated with sodium and radium, blending extracted groundwater with clean water from an upgradient portion of the Site, and treatment and disposal of the blended water through land application on an upgradient on-site spray field. Groundwater remediation will continue until the groundwater meets the performance standards identified in the ROD. This portion of the cleanup is expected to cost approximately $950,000. The groundwater cleanup will operate for an estimated 7 - 10 years before the performance standards are met.

The wetlands cleanup, for the upper portion of the Southwest Wetland, would include clearing existing vegetation, removal of contaminated sediment, and revegetation. Sediment with lead levels above 600 ppm would be solidified and disposed of in the on-site landfill (600 ppm is the minimum level which requires solidification as established for OU 1); excavated sediment containing lead at concentrations lower than 600 ppm but above 160 ppm would be used as a soil additive for excavated upland areas on-site. Excavated sediment containing lead below the disposal standards would be used in the reconstruction of the upper portion of the Southwest Wetland. The wetland cleanup is expected to cost approximately $312,000 dollars.

Operable Unit Two is the second and final operable unit for this Site; no other cleanup actions are necessary after completion of activities for Operable Unit One and Two.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy addresses the statutory preference for remedies that employ treatment for the reduction of toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

EPA will conduct a policy review for this action within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The groundwater remedial action is expected to achieve its goals within 10 years. The wetland remedial action is expected to achieve its goals within one year, but should be reviewed to confirm the continued effectiveness of the remedy.

<IMG SRC 0494212>

John H. Hankinson, Jr. Date
Regional Administrator

TABLE OF CONTENTS

TABLES

FIGURES

RECORD OF DECISION
THE DECISION SUMMARY
FLORIDA STEEL CORPORATION
INDIANTOWN, FLORIDA

1.0 SITE NAME, LOCATION, DESCRIPTION

The Florida Steel Corporation (FSC) Site is located on Highway 710 approximately two miles northwest of Indiantown in Martin County, Florida (see Figure 1 - Site Location). Indiantown is about 30 miles northwest of West Palm Beach. Indiantown has a population of about 5,000 people, most of whom are employed in the nearby citrus farms or in local commerce.

The Site covers approximately 150 acres and is bounded on the north by the Seaboard Coast Line (CSX) railroad and State Highway 710. Wetlands and mostly unimproved land are located around the Site; the unimproved land is zoned industrial. A private company is building an electric power/steam plant adjacent to the Site.

The nearest downgradient residence is about one-half mile south of the Site; there are several other dwellings located within one mile downgradient of the site.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Indiantown site was acquired by FSC in 1969 for the purpose of constructing a steel mill using electric arc furnace technology for recycling scrap steel, primarily junk automobiles, into new steel products including concrete reinforcing steel and round and square merchant bar.

The Indiantown steel mill operated from November 1970 until February, 1982, when, because of the prevailing depressed economic conditions, FSC decided to cease production at that facility. The mill has not been operated since that time; several on-site buildings have since been demolished.

Much of the soil contamination at the Site is due to emission control (EC) dust, a residue from the mill's process. The main constituents of EC dust are cadmium, iron, lead, and zinc oxides. The EC dust was deposited in two on-site disposal areas until November 1980. After that time, the newly generated EC dust was collected and shipped off-site in accordance with new EPA regulations. Groundwater contamination at the Site is due to the discharge from water softening systems at the mill. This discharge contained sodium and radium. Radium, a naturally occurring element in groundwater, may have been concentrated within the ion exchange resin of the water softener and then discharged via periodic back flushing of the resin.

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In December 1982, the FSC Indiantown Mill property was included on the National Priority List (NPL) under the provisions of CERCLA. The listing was based on the potential threat to the environment from the heavy metals present in the EC dust.

In 1983, polychlorinated biphenyls (PCBs) were detected in some Site soil. PCBs are present due to fluid leaks from hydraulic systems used at the mill until 1975.

FSC, under supervision by FDEP and EPA, has conducted previous cleanup activities for EC dust and PCB contaminated soils. In 1985, FSC removed approximately 8000 tons of EC dust and shipped it to a metal recycling facility. However, some EC dust remains at the Site.

In 1986, FSC excavated approximately 18,000 tons of soil, sediment, and EC dust which contained PCBs at concentrations above 50 ppm and placed it in a secure on-site storage vault. During 1987-1988, FSC incinerated the material contained in the vault. The resulting ash contains metals and is currently stored in a covered building on-site.

Various investigations have been conducted by FSC with oversight provided by FDEP and/or EPA. In 1991, a remedial investigation (RI) was completed by FSC which described the type and extent of soil and groundwater contamination at the Site. PCBs and metals such as cadmium, lead, and zinc are present in Site soil. Sodium and radium were the primary contaminants found in groundwater at the Site.

In addition to the studies conducted by FSC, EPA prepared a Wetland Impact Study for wetland areas located south and east of the Site. Metals, mainly lead and zinc, were found in sediment and surface water, but at levels typically lower than the levels on-site. PCBs were detected in only one sediment sample from the wetlands. The highest concentrations of metals in sediment were found in a wetland located immediately southwest of the Site (the "Southwest Wetland").

In April 1992, EPA held a public meeting to discuss possible cleanup alternatives for contaminated soil and groundwater (cleanup alternatives for the wetlands had not been developed at that time). The cleanup alternatives were based on a Feasibility Study (FS) prepared by FSC, with oversight provided by FDEP and EPA, to address the soil and groundwater contamination. After reviewing public comments on the alternatives, which was generally critical of the proposed groundwater cleanup method, EPA directed FSC to evaluate additional methods for the cleanup of groundwater.

In June 1992, EPA selected a soil cleanup method which includes excavation and solidification of contaminated soil and ash followed by disposal in an on-site landfill. FSC has signed a Consent Decree which requires them to perform the soil cleanup and to repay over $300,000 dollars for EPA's costs associated with the Site.

During the fall of 1992, FSC conducted treatability studies for contaminated groundwater and was not able to detect lead and cadmium in groundwater samples collected from the Site. EPA then directed FSC to conduct two separate split sampling events for groundwater to confirm the presence or absence of lead and cadmium EPA participated in the second split sampling event which involved sample analysis by three different labs, including the EPA lab. It was determined that lead and cadmium were not present above health based levels in groundwater at the Site. Previous positive detections of lead and cadmium were attributed to interference from the sodium chloride and other dissolved solids in the groundwater plume.

FSC submitted a draft and final FS in June and November 1993, respectively. The FS addresses both groundwater and wetlands and incorporates the results of the recent groundwater sampling results.

3.0 HISTORY OF COMMUNITY RELATIONS

Over 200 copies of the Proposed Plan were mailed to interested parties on February 11, 1994. Advertisements were placed by EPA in the Indiantown News and Stuart News on February 16, 1994. These quarter page advertisements described the proposed cleanup methods and announced the upcoming public meeting and the 30 day public comment. The Palm Beach Post and Stuart News both featured front page stones in the "local" sections of their newspapers. The articles also repeated the dates and times for the public meeting and public comment period.

EPA staff gave a brief presentation regarding the Proposed Plan at the local Kiwanis luncheon on March 2, 1994. EPA staff also met with property owners whose land includes the Southwest Wetland which has been impacted by the Site. These landowners had received copies of the sampling information and the feasibility study months before the mailing of the Proposed Plan.

The public meeting was held on March 3, 1994, at the Indiantown Middle School. 14 people attended the meeting, including nearby residents, newspaper reporters from the Stuart News and Palm Beach Post, and representatives from the Martin County Health Department and FDEP. Various questions were posed by the audience, but the audience was ultimately supportive of EPA's Proposed Plan. Articles appeared in both the Stuart News and Palm Beach Post on March 4 and summarized the information presented in the public meeting.

The public comment period was held from February 18 through March 19. Five responses were submitted by the general public during this time; the responses generally expressed support for EPA's Proposed Plan. The recent public comments were in contrast to public comments received in April 1992 when EPA proposed that treated groundwater be discharged to the St. Lucie Canal. The community was strongly opposed to any discharge to the St. Lucie Canal.

An information repository has been located at the local public library in Indiantown since March 1992. The repository contains the Administrative Record and other documents detailing activities at the Site.

4.0 SCOPE AND ROLE OF ACTION

The planned actions for this site address contamination in groundwater and wetland sediment. These actions are collectively described as Operable Unit Two, a management term to note the different portions of the overall site cleanup. Actions for Operable Unit One, which address metals and PCB contaminated soil located on-site, are currently in the Remedial Design stage; construction related to Operable Unit One should begin by early 1995.

Operable Unit Two is the second and final operable unit for this Site; no other cleanup actions are necessary after completion of activities for Operable Unit One and Two.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 Hydrogeology

There are two major aquifers in Martin County: the unconfined surficial aquifer that occurs from approximately five feet to 130 feet below land surface (bls), and the artesian Floridan aquifer that occurs from 600 to 1,500 feet bls. The Anastasia formation is probably the principal source of groundwater in the shallow aquifer. Permeable parts of the Avon Park limestone and the Ocala Group Limestone comprise the principal producing zones of the Floridan aquifer. These two aquifers are separated by a thick section of sand and clay of low permeability.

The shallow aquifer is the principal source of fresh water supplies in Martin County. It includes the Pamlico sand, the Anastasia formation and possibly the Caloosahatchee marl.

Groundwater from the artesian aquifer in the vicinity of Indiantown is somewhat brackish with chloride and total dissolved solids concentrations on the order of 500 and 1,000 mg/l, respectively.

The boring logs for wells installed at the Site show that the surficial aquifer at the site is comprised of two zones of relatively high permeability separated by a unit of lower permeability. The upper zone is unconfined and bounded above by the water table and below by a thin silty layer at a depth of approximately 30 feet below land surface. Lithologically, the upper zone consists of fine to medium silica sand with a discontinuous hardpan layer near land surface. Below the silty layer is approximately 55 feet of very dense, very fine grained sand with interbedded clay lenses that provide additional confinement of the lower zone.

At a depth of approximately 85 feet below land surface there is a sandy shell layer with a thickness of approximately 30 to 40 feet. This lower zone is the most productive of the two zones of the shallow aquifer.

In the Indiantown area, most water supply wells are screened or open in the lower portion of the surficial aquifer; however, small diameter open-end wells can be constructed below the hardpan, in the permeable sand extending to 30 feet below the land surface.

The nearest potable wells in the shallow aquifer are located approximately 1/2 mile south (i.e., downgradient) of the Site. The water supply wells for the community of Indiantown, located over 2 miles southeast of the mill, are also screened in the shallow aquifer from 100 to 125 feet below ground surface.

The water table is approximately five feet below grade and the seasonal fluctuation ranges from two to five feet. The direction of groundwater flow at the Site is to the south toward the St. Lucie Canal. The rate of groundwater flow is approximately 40 - 50 feet per year.

5.2 Hydrology

The surficial sands throughout most of central Martin county are sufficiently permeable to absorb practically all 60 inches of annual rainfall; consequently, drainage is chiefly underground. Due to the flatness of the terrain, ponds form throughout most of the region during the rainy season. Surface water flow from the site is intermittent, occurring only during the rainy season.

The St. Lucie Canal, which is approximately two miles southwest of site at its closest pount, is the major channel used for control of water levels in Lake Okeechobee. The canal originates on the east shore of the lake and flows generally northeastward for about 40 miles to the Atlantic Ocean. The upper reaches constitute an engineered canal but the lower channel follows the canalized course of the South Fork of the St. Lucie River. Indiantown and a large part of Martin County lies within the Indian River Lagoon Drainage Basin. Surface water in the Indiantown area can flow into the channelized St. Lucie Canal which flows into the St. Lucie River at Stuart.

Surface water on the FSC Indiantown Mill property can flow either to the borrow pit/retention pond in the Southeast corner of the site or to the ditch along the southwest property line. Since the borrow pit and ditch are connected, water flows from the borrow pit/retention pond to the ditch. There is an opening in the dike for the ditch at approximately the center of the southern property line. Water flowing off-site through this opening flows southwest to the perimeter ditch around the Talquin Corporation orange groves. The perimeter ditch flows east around the groves and discharges into a county ditch which flows south to the St. Lucie canal.

During clean-up of PCBs from the borrow pit/retention pond in 1986, a culvert at the east end of the pond was removed. Prior to its removal, this culvert may have allowed offsite drainage to the east during periods of extremely high water. Surface water from the culvert would have flowed north to approximately the middle of the eastern FSC property line and then offsite to the east.

5.3 Ecology and Natural Resource Features

General vegetational communities in the area include palmetto and slash pine scrub interspersed with seasonally and permanently flooded wetland areas with emergent herbaceous species and deciduous and evergreen shrubs. There are several areas of standing open water greater than three feet in depth on the site. These areas (referred to as the "polishing pond" and "borrow pit"), are the result of excavation to obtain clean fill during construction of the steel mill. Aquatic and emergent floral species including duckweed, arrowhead, hyacinth, water lily, cattail and giant reed occur in abundance in these areas.

Plant communities typical of south-central Florida have been described for several locations. Terrestrial forested, wetland forested, marsh/aquatic, and spoil and barren communities are in the vicinity of the Site.

As noted above, the Site lies within the St. Lucie Canal Drainage Basin. The regional surface water system consists of a series of man-made drainage ditches that ultimately discharge into the St. Lucie Canal, a water body that is essentially the channelized South Branch of the Indian River which terminates in an estuarine system at the Indian River Lagoon, approximately 25 miles downstream from Indiantown. The coastal ecology for this area has been extensively inventoried and characterized by several individuals and agencies. The estuarine waters in the St. Lucie Inlet have been designated Class II (Shellfish Propagation and Harvesting). The barrier islands adjacent to the Inlet are designated as "Habitats of Species of Special Concern", and the waters of St. Lucie Inlet State Park are designated as "Special Waters" by the State of Florida (Chapter 17-3). The Indian River Lagoon watershed has been designated a "priority water body" by the State.

There is no information to suggest that the Site, or areas immediately adjacent to the Site, provide critical habitat for threatened or endangered species. During reconnaissance of the area, there was no evidence of permanent or sustained use of the area by threatened Or endangered species (i.e., no bald eagle or everglades kite nest sites, etc., were observed). Previous environmental investigations conducted in the Indiantown area in the vicinity of the St. Lucie Canal also indicted that the area is not a significant habitat for threatened or endangered species.

5.4 Groundwater Contamination

A groundwater plume extends south from the vicinity of the brine discharge from the plant's former water softener to a distance of approximately 600 feet beyond the southern property line (see Figure 2 - Site Layout). The plume generally extends to a depth of approximately 35-40 feet. However, sodium and radium were detected above MCLs in one deep well (120 feet below ground) located in the area of the former water softener discharge. The extent of the plume has been defined by analytical data and electromagnetic geophysical surveys. Analytical data has been collected from numerous monitoring wells with depths ranging from approximately 10 feet to 125 feet below land surface.

The plume is primarily characterized by levels of sodium and radium which exceed State or Federal groundwater standards. The presence of sodium chloride in groundwater at the Site is due to the past discharges from the mill's water softener to the ground The dissolved sodium chloride may have caused naturally occurring radium to leach from the soil. It is also possible that naturally occurring radium in the groundwater withdrawn by the former production well was concentrated by cation exchange with the column resin in the water softener.

Vinyl chloride and benzene were detected at concentrations above groundwater standards in 5 out of 53 samples collected during the summer of 1993. The highest reported concentrations were 12 ppb and 4 ppb, respectively. Tetrachloroethene was detected once at a level of 15 ppb. The five wells are located downgradient of the old mill buildings.

The following results are based upon data collected over several years including the data generated during three recent triplicate sampling events. EPA participated in one round of triplicate sampling. The triplicate sampling results indicate that lead and cadmium do not exceed groundwater standards as was previously reported. Apparently total dissolved solids in the groundwater samples may have interfered with the analyses for lead and cadmium.

TABLE 1: Summary of Primary Groundwater Sampling Results

Groundwater Contaminant	Florida MCL	Federal MCL	Average Concentration	Min - Max Concentrations
Sodium	160 mg/l	None	588 mg/l	66 - 1310 mg/l
Radium 226+228	5 pCi/l	5 pCi/l	26 9±1.0 pCi/l	1.6- 141 pCi/l
Gross Alpha	15 pCi/l	15 pCi/l	15±34 pCi/l	1±7 - 98±83 pCi/l

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5.5 Wetland Contamination

Five distinct wetlands, located adjacent to the FSC property, were evaluated as part of a Wetland Impact Study conducted by EPA. The study included the classification of the wetlands, collection of surface water samples, sediment samples, and tissue samples from plants and small creatures. Sediment and surface wster samples were collected from each of the five wetlands and analyzed for metals and PCBs.

Some sediment samples contained concentrations of lead and zinc that exceeded both the possible and probable biological effects levels as summarized in available literature. Supplemental sediment sampling conducted by FSC further defined the extent of sediment contamination and indicated that the highest levels of metals were found in the top six inches of sediment in the northeastern or upper portion of the "Southwest Wetland" (see Figure 2 - Site Layout). Table 2 lists the contaminant concentrations in sediment samples collected from the Southwest Wetland. Contaminant concentrations in on-Site soil are also provided for comparison.

This wetland is located adjacent to the southern boundary of the FSC property and has received surface water runoff from the Site. The Southwest Wetland is approximately 10.8 acres in size, is seasonally flooded, and includes seven different vegetation zones (see Figure 3 - Vegetation Zones). The upper portion of this wetland, which contains the higher levels of lead and zinc, is comprised of a scrub-shrub wetland and a pine-palmetto flatwood. A pickerelweed marsh and a primrosewillow/sawgrass wetland represent the remainder of the wetland and cover the majority of the area in the Southwest Wetland. The Southwest Wetland and other wetlands around the Site were evaluated using the Wetland Evaluation Technique (WET). This technique rates a wetland according to several factors including sediment retention, floodflow alteration, and potential for supporting wildlife. The Southwest wetland, and most of other wetland areas, were generally classified as highly functional wetlands.

Animal and insect species were collected and counted in each wetland area. Crayfish and tadpoles were absent from the sampling location in the upper portion of the Southwest Wetland. Tadpoles and other species were more prevalent at the sampling location in the lower portion of the Southwest Wetland. It is possible that the higher levels of zinc and lead in sediment contributed to the apparent lack of tadpoles and crayfish. These two species both spend a portion of their life closely associated with the sediment.

The sediment sampling conducted in the Southwest Wetland indicated a decreasing concentration gradient of metals in sediment with the highest levels found adjacent to the FSC property boundary (see Figures 4 and 5 - Lead and Zinc Concentrations in SW Wetland Sediment). Much lower levels were found at the opposite side of the wetlands. PCBs were detected in only one sample at a concentration of .002 ppm.

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A similar decreasing concentration gradient was observed in surface water within the Southwest Wetland. Aluminum, copper, iron, lead, and zinc are found at levels that exceed either Florida Class III Water Quality Standards or the National Ambient Water Quality Criteria from the upper portion of the Southwest Wetland; concentrations decrease but slightly exceed the criteria for lead and zinc in the lower portion of the wetland.

Tissue samples were collected from available plants and small creatures (beetles, tadpoles, crayfish) in the wetlands to determine if metals found in surface water and sediment were bioaccumulating in the food chain. Zinc was found in varying concentrations in the tissue samples; the highest concentration, 280 ppm, was found in a plant sample in the upper portion of the Southwest wetland. Lead was found in some tissue samples; the highest concentration, 14 ppm, was found in a beetle from the upper portion of the Southwest wetland.

Toxicity testing of water and sediment samples upon test organisms was inconclusive. It was not possible to determine whether the water and sediment samples or the test methods themselves affected the test organisms.

TABLE 2: CONTAMINANT CONCENTRATIONS IN SITE SOIL AND THE SOUTHWEST WETLAND SEDIMENT

Soil/Sediment Contaminants	Range of Concentrations in Site Soil (ppm)	Range of Concentrations in Wetland Sediment (ppm)
Cadmium	2 - 380	<1 - 8
Lead	4 - 12,200	8 - 667
Zinc	32 - 110,000	164 - 6010
PCBs	1 - 1,100	.220 (detected in only 1 sample)

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6.0 SUMMARY OF SITE RISKS

CERCLA directs EPA to conduct a baseline risk assessment to determine whether a Superfund Site poses a current or potential threat to human health and the environment in the absence of any remedial action. The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline indicating what risks could exist if no action were taken at the Site. This section of the ROD reports the results of the baseline risk assessment conducted for this Site.

6.1 Contaminants of Concern

The contaminants measured in the various environmental media during the RI were included in this discussion of the site risks if the results of the risk assessment indicated that a contaminant might pose a significant current or future risk or contribute to a cumulative risk which is significant. The criteria for a significant risk was a carcinogenic risk level above the acceptable risk range, i.e., 1x10-4 to 1x10-6, or a hazard quotient (HQ) greater than 1.0 (unity). In addition, contaminants, such as sodium, which are present at levels above state primary groundwater standards were also included as contaminants of concern. The contaminants of concern in groundwater are sodium, gross alpha, and radium-226 and -228.

The exposure point concentrations for each of the chemicals of concern and the exposure assumptions for each pathway were used to estimate the chronic daily intakes for the potentially complete pathways. Generally, the exposure point concentrations are based on either the calculated 95% Upper Confidence Limit (UCL) of the arithmetic mean or the maximum concentration detected during sampling. If the calculated UCL exceeded the maximum level measured at the Site, then the maximum concentration detected was used to represent the reasonable maximum concentration. The chronic daily intakes were then used in conjunction with cancer slope factors and noncarcinogenic reference doses to evaluate risk.

At this Site, the groundwater concentrations used in calculations of chemical intakes were based on the 95% UCL of measured concentrations from the wells most strongly influenced by the high total dissolved solids (TDS) plume. Flow from the current plume boundary to potential receptors has been assumed to follow a plug flow pattern with no attenuation or dilution.

6.2 Exposure Assessment

Whether a chemical is actually a concern to human health and the environment depends upon the likelihood of exposure, i.e. whether the exposure pathway is currently complete or could be complete in the future. A complete exposure pathway (a sequence of events leading to contact with a chemical) is defined by the following four elements:

! A source and mechanism of release from the source,

! A transport medium (e.g., surface water, air) and mechanisms of migration through the medium,

! The presence or potential presence of a receptor at the exposure point, and

! A route of exposure (ingestion, inhalation, dermal absorption).

If all four elements are present, the pathway is considered complete.

The exposure pathway that contributes to possible human health risk is future residential consumption of groundwater at nearby off-site locations if contaminant concentrations are not reduced. This pathway is based on the assumption that a future resident would have a body weight of 70 kilograms (kg) and would drink 2 liters of water every day for 30 years.

Residential uses of the Site itself were not evaluated in the risk assessment. Deed restrictions on the use of the site have been filed with the Martin County Clerk of Circuit Court. The deed restrictions limit use of the site to mostly industrial/commercial activities. The restrictions are already in effect and will remain in effect regardless of the cleanup activities that occur. In addition, a coal fired power plant is under construction on adjacent property southwest of the site. Furthermore, a 500 kilovolt electric power line is to be erected across the western portion of the site.

The nearest downgradient potable well is over 1,400 feet from the plume's boundary and is currently not impacted by the contamination plume. Therefore, ingestion of groundwater under current conditions is not quantitatively assessed. No potable or non-potable wells are currently in use on the site and consequently are not assessed under the current use scenario.

Given an estimated maximum flow velocity of 50 feet/year and a distance of approximately 1400 feet from the edge of the contaminated groundwater plume to the nearest residential well, it would take about 28 years for the plume to reach the nearest well. Nevertheless, groundwater samples were collected from the two wells nearest the Site during the RI. Concentrations of sodium and gross alpha were below drinking water standards in those wells.

6.3 Toxicity Assessment

Toxicity values are used in conjunction with the results of the exposure assessment to characterize Site risk. EPA has developed critical toxicity values for carcinogens and noncarcinogens. Cancer slope factors (CSFs) have been developed for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CSFs, which are expressed in units of (mg/kg/day)-1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CSF. Use of this conservative approach makes underestimation of the actual cancer risk highly unlikely. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. The CSF for radium-226 is 1.2 x 10-10.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

6.4 Risk Characterization

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Human health risks are characterized for potential carcinogenic and noncarcinogenic effects by combining exposure and toxicity information. Excessive lifetime cancer risks are determined by multiplying the estimated daily intake level with the CSF. These risks are probabilities that are generally expressed in scientific notation (e.g., 1x10-6). An excess lifetime cancer risk of 1x10-6 indicates that, as a plausible upper boundary, an individual has a one in one million additional (above their normal risk) chance of developing cancer as a result of Site-related exposure to a carcinogen over a 70-year lifetime under the assumed specific exposure conditions at a Site.

EPA considers individual excess cancer risks in the range of 1x10-4 to 1x10-6 as protective; however the 1x10-6 risk level is generally used as the point of departure for setting cleanup levels at Superfund sites. The point of departure risk level of 1x10-6 expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range.

The risk associated with future residential consumption of contaminated groundwater from the plume located adjacent to the Site is 2.89×10^{-4}. This calculated risk is based upon ingestion of contaminated groundwater which contains Ra-226. There are no agency approved reference doses or cancer slope factors for sodium or gross alpha, therefore the risk could not be calculated. However, there are either state or federal primary groundwater standards for sodium and gross alpha; since concentrations of these contaminants exceed the primary standards, they are included as contaminants of concern.

The Wetland Impact Study indicated that the Southwest Wetland is a highly functional wetland. However, there are indications that the contaminants in the Southwest Wetland, particularly in the northern portion, may cause adverse ecological effects. Table 3 below lists the concentrations of metals detected in sediment from the Southwest Wetland along with various concentrations obtained from literature that are used as screening values for the possibility of ecological effects. The Probable Effects Levels (PELs) referred to in the Proposed Plan are included within the range of concentrations indicative of biological effects listed in Table 3. Information such as the screening values were utilized in conjunction with site specific data collected in the Wetland Impact Study to define the contamination presenting some level of environmental risk.

According to the results from Wetland Impact Study, metals such as lead and zinc were present above screening values, particularly in sediment in the northern or upper portion of the Southwest Wetland. For example, lead was detected in sediment at a concentration of 250 ppm at the sample location SW-10, which is located in the upper portion of the wetland. Lead was detected at a much lower value, 8 ppm, at the sample location SW-11, located in the lower portion of the wetland. Lead and zinc in surface water samples also exceeded surface water standards, again particularly in the northern portion of the Southwest Wetland. In addition, lower numbers of individuals and species of animals and insects were found in the northern portion of the Southwest Wetland; crayfish and tadpoles were absent from the sampling location in the northern portion of the Wetland. The degree of bioaccumulation, as described by the concentrations of metals in tissue from the available plants, animals, and insects, was also highest in the upper portion of the Southwest Wetland. Toxicity testing of water and sediment samples upon test organisms was inconclusive. It was not possible to determine whether the water and sediment samples or the test methods themselves affected the test organisms.

TABLE 3: CONCENTRATIONS OF DETECTED METALS IN SOUTHWEST WETLAND SEDIMENT AND SCREENING VALUES FOR BIOLOGICAL EFFECTS*

Sediment Contaminants	Range of Concentrations in Wetland Sediment (ppm)	Range of Concentrations Indicative of possible biological effects (ppm)	Range of Concentrations Indicative of probable biological effects (ppm)
Lead	8 - 667	21 - 46.7	110 - 218
Zinc	164 - 6010	68 - 150	270 - 410

* Biological Effects Levels are based upon information in the following documents:

a) Long, Edward R. and Lee G. Morgan, 1990. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical memorandum NOS AOM 52, Office of Oceanography and Marine Assessment, Seattle, WA.

b) MacDonald. D.D., 1993. Development of an approach to the assessment of sediment quality in Florida coastal waters. Florida Department of Environmental Regulation, Tallahassee, FL. (Draft document)

c) Long, Edward R., Donald D. MacDonald, Sherri L. Smith, and Fred D. Calder, in press. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management.

6.5 Risk Uncertainty

At all stages of the risk assessment, conservative estimates and assumptions were made so as not to underestimate potential risk. Nevertheless, uncertainties and limitations are inherent in the risk assessment process.

The estimates of exposure point concentrations of the chemicals of concern probably overstate actual concentrations to which individuals would hypothetically be exposed and therefore, the health risk estimates are very conservative. In addition, no attenuation of the contaminants was considered; however, attenuation will reduce concentrations of contaminants over time.

7.0 SUMMARY OF ALTERNATIVES

Based on the results of the RI/FS reports and agency regulations and guidelines, cleanup levels were developed that would be protective of human health and the environment. These cleanup levels form the basis for the various cleanup alternatives.

7.1 Cleanup Levels

The groundwater cleanup levels are based on state and federal standards, referred to as Maximum Contaminant Levels (MCLs), and appropriate EPA directives. The relevant and appropriate groundwater standards for groundwater cleanup include those listed in Table 1.

A cleanup area, rather than a cleanup level, has been chosen for sediment in the Southwest Wetland. The cleanup area encompasses the upper portion of the wetland: the upper area is the area which lies between the Florida Steel property line and an line located approximately 700 feet southwest of, and nearly parallel to, the Florida Steel property line (see Figures 4 and 5). The cleanup area was selected after evaluation of a literature review of biological effects levels, site-specific ecological data, the decreasing concentration gradient for metals in the wetland sediment, and preservation (where possible) of the functional wetland. The literature review, including the Florida PELs, suggests a range of reported concentrations indicative of probable biological effects which are listed in Table 3.

The sediment cleanup includes a risk management decision to excavate in only the area where available information indicates a likely environmental threat. This cleanup will preclude disturbing the portion of this functional wetland where lower levels of metals are present in sediment but where the potential for environmental risk is much lower. Site specific data which highlight the differences in potential environmental risk are presented in the following table:

TABLE 4: ENVIRONMENTAL INDICATORS IN UPPER AND LOWER PORTIONS OF SOUTHWEST WETLAND

General Indicator	Specific Indicator	Upper Portion of Southwest Wetland	Lower Portion of Southwest Wetland
Bioaccumulation	Lead (mg/kg in pickerelweed)	.84	ND
	Zinc (mg/kg in pickerelweed)	110	27
Biodiversity	# of Taxa	5	9
	# of Individuals	44	321

Lead and zinc concentrations in the sediment both follow a decreasing concentration gradient in the wetland sediment. Lead and zinc concentrations in the sediment from the lower portion of the Southwest Wetland are between 5 to 20 times lower than the sediment concentrations found in the upper portion of the Southwest Wetland.

Lead and zinc are both elevated in the sediment to be excavated from the upper portion of the Southwest Wetland, an area where fewer species and organisms were found during the Wetland Impact Study. In contrast, the lower portion of the Southwest Wetland, contains zinc in sediment at moderate levels but contains almost twice the number of species and almost eight times the number of organisms as found in the upper portion of the Southwest Wetland.

Various Site specific cleanup methods for groundwater and the Southwest wetland were developed based upon the cleanup levels established for the Site. As required by CERCLA, a no further action alternative was also evaluated to serve as a basis for comparison with the other active cleanup methods. Groundwater alternatives and wetland alternatives are described in the following section. A detailed description of each of these alternatives is provided in the FS report.

7.2 Groundwater Alternatives

Alternative 1 - No Action

No cleanup activities would occur, but continued monitoring would occur. Groundwater quality at and downgradient of the site would be monitored on a regular basis for up to 30 years. The monitoring data would be analyzed to document the expected decreasing concentrations over a period of many years. However, it may take up to 100 years for sodium and radium concentrations in the groundwater plume to be naturally reduced to the MCL concentrations.

Alternative 2 - Withdraw Groundwater, Treat to Remove Radium, and Discharge Treated Water to a Third Party User or the St. Lucie Canal.

This alternative would include the following components:

- Install withdrawal wells within the area of the groundwater plume.
- Install a force main to dispose of treated groundwater to a third party user or the St. Lucie Canal.
- Install injection wells along the perimeter of the plume to maintain groundwater levels outside the plume area and to enhance the rate of groundwater withdrawal within the plume. Water supply wells would be installed on upgradient portions of the Site to obtain clean water for injection.
- Withdraw groundwater which exceeds federal or Florida groundwater standards for sodium and radium (see MCLs in Table 1).
- Treat the groundwater in the on-site chemical treatment and filtration plant to meet the discharge limit for radium, iron and any other parameters which would be prescribed in the FDEP and NPDES permits or as required by the third party user. Sodium levels in the treated water would be dependent upon the requirements of the third party user or the discharge permits.
- Dispose of the water treatment sludge at an approved facility.
- Monitor groundwater quality to evaluate system performance.

Alternative 3 - Withdraw Groundwater, Treat to Remove Sodium and Radium by Reverse Osmosis, Dispose of Brine through Deep Well Injection, and Discharge Clean Water by Injection into Shallow Aquifer

- Install withdrawal wells within the area of the groundwater plume.
- Set up an on-site reverse osmosis treatment plant to remove sodium and radium from the plume.
- Transport approximately 6,000 gallons of brine per day from reverse osmosis plant to off-site facility for deep well injection.
- Withdraw and treat groundwater which exceeds groundwater standards for sodium and radium (see MCLs in Table 1).
- Inject the treated water into the surficial aquifer along the perimeter of the plume.
- Monitor groundwater quality to evaluate system performance.

Alternative 4 - Withdraw Groundwater, Blend with Clean Water from Upgradient Portion of the Site, and Dispose of the Blended Water Through Land Application on an Upgradient On-site Spray Field

- Install withdrawal wells within the area of the groundwater plume.
- Withdraw groundwater from the plume until the water in the plume meets federal and state groundwater standards for sodium and radium (see MCLs in Table 1).
- Install upgradient wells on-site to supply clean water.
- Inject clean water around perimeter of the plume to enhance plume withdrawal.
- Blend clean water with the contaminated groundwater so that the blended water meets State and Federal primary drinking water standards (see MCLs in Table 1).
- Dispose of the blended groundwater through spray irrigation on an upgradient on-site spray field.
- Monitor groundwater quality to evaluate system performance and to document that the MCLs have been met.
- Monitor soil within the spray field area to confirm that contaminants do not accumulate at adverse levels due to the spraying process.

7.3 Southwest Wetland Alternatives

Alternative 1: No Action

No cleanup activities would be performed, but surface water, plant and animal tissue, and sediment within the wetland would be sampled annually on a regular basis for up to 30 years to document any changes in contaminant concentrations.

Alternative 2a: Clear Existing Vegetation, Remove Contaminated Sediment, and Revegetate.

- Clear vegetation from area of contaminated sediment.
- Excavate the contaminated sediment from the entire Southwest Wetland and haul to the Site. Sediment with lead concentrations above 600 ppm will be solidified and disposed of in the on-site landfill (the solidification standards and on-site landfill were

required as part of OU1). Excavated sediment with lead concentrations below 600 ppm but higher than 160 ppm will be used as an organic soil additive on upland portions of the Site excavated as part of OU1.

- Excavate the remaining sediment which contains lead below 160 ppm and stockpile for possible later use in reconstruction of the wetland.

- Backfill the excavation to approximately 12 inches below original grade with sand fill.

- Add approximately 6 inches of the stockpiled sediment to bring the excavated area back to within 6 inches of original grade.

- Revegetate the excavated areas with native vegetation.

Alternative 2b: Clear Existing Vegetation, Remove Contaminated Sediment, and Revegetate.

This alternative is identical to Alternative 2a except that all sediment containing lead concentrations above 160 ppm is disposed of in the on-site landfill; none is used as a soil amendment for areas disturbed during the OU1 cleanup.

Alternative 3a - Clear Existing Vegetation and Remove Contaminated Sediment from Most Contaminated Portion of the Southwest Wetland, Revegetate the Disturbed Area.

This alternative is similar to alternative 2a except that about 3.8 acres of the Southwest Wetland (see Figure 2), would be excavated instead of the entire wetland. The portion to be excavated contains the majority of the metals contamination (see Figures 4 and 5).

Alternative 3b: Clear Existing Vegetation and Remove Contaminated Sediment from Most Contaminated Portion of the Southwest Wetland, Revegetate the Disturbed Area.

This alternative is similar to alternative 2b except that a portion of the Southwest Wetland (see Figure 2) would be excavated instead of the entire wetland. This portion contains the majority of the metals contamination (see Figures 4 and 5).

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The alternatives are evaluated against one another by using the following nine criteria:

- Overall protection of human health and the environment.
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).
- Long term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume through treatment.
- Short term effectiveness.
- Implementability.
- Costs.
- State Acceptance.
- Community Acceptance.

The NCP categorized the nine criteria into three groups:

(1) Threshold criteria: the first two criteria, overall protection of human health and the environment and compliance with ARARs (or invoking a waiver), are the minimum criteria that must be met in order for an alternative to be eligible for selection

(2) Primary balancing criteria: the next five criteria are considered primary balancing criteria and are used to weigh major trade-offs among alternative cleanup methods

(3) Modifying criteria: state and community acceptance are modifying criteria that are formally taken into account after public comment is received on the proposed plan. State and community acceptance is addressed in the responsiveness summary of the ROD.

The comparative analysis of the various alternatives proposed for this Site are presented in the following section.

8.1 Comparative Analysis of Remedial Alternatives

- ! Overall protection of human health and the environment

All the alternatives, except for no-action, would provide protection of human health and the environment. The groundwater treatment alternatives all involve removal of the groundwater contaminant plume and some action to ensure that the concentrations of groundwater contaminants are permanently reduced.

The wetland alternatives, except for no-action, would provide protection of the environment. There are no human health concerns for exposure to wetland sediment, given the anticipated exposure scenarios. The wetland treatment alternatives differ in the level of sediment excavation; alternatives 3a and 3b limit the amount of sediment excavation and therefore strike a balance between contaminant removal and preservation of a functional wetland.

- ! Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The no-action groundwater alternative would not comply with the 40 CFR 141, the National Primary Drinking Water Standards, because the standards for radium-226 and gross alpha are currently exceeded in the groundwater plume. It would not comply with Florida Administrative Code (FAC) 17-550.310, the Florida Primary Drinking Water Standards, because the standard for sodium is currently exceeded in the groundwater plume.

Groundwater alternatives 2, and 3 would comply with State and Federal requirements for water quality and off-site discharges. These requirements are listed in Tables 4 and 5 under the Clean Water Act, the Safe Drinking Water Act, and the Florida Administrative Code. Groundwater alternative 4 would also comply with the requirements, except that this alternative does not include an off-site discharge.

The wetland alternatives, except the no-action alternative, would comply with all federal and state ARARs. The no-action alternative may not comply with surface water standards, however, actions to be taken under Operable Unit One are expected to improve the quality of surface water runoff from the Site to the wetlands, thus improving surface water quality in the adjacent wetland. The no-action alternative would not follow the sediment screening values, which are not ARARs. but "To Be Considered."

The wetland alternatives 2a and 2b would follow the sediment screening values. However, these alternatives would achieve limited compliance with Executive Order 11990, Protection of Wetlands. These alternatives include revegetation and appropriate management of the reconstructed wetlands, but require excavation of the sediment with lead or zinc above their respective screening values. Such extensive excavation would maximize the impact to the existing highly functional Southwest Wetland.

The wetland alternatives 3a and 3b would follow the sediment screening values within the areas to be excavated. In addition, these alternatives would achieve compliance with Executive Order 11990 by minimizing the impact to the wetlands by limiting the excavation to the sediment in the Southwest Wetland that contained the highest levels of lead and zinc.

TABLE 5
POTENTIAL LOCATION SPECIFIC ARARs

	Citation	Location/Description
A	**!**Wetlands Protection Executive Order 11990 (40 CFR 6.302 (a))	Wetlands/Executive Order 11990 requires avoidance or minimization of impacts to wetlands.
R&A	**!**Endangered Species Protection (40 CFR 6.302 (h)	Requires efforts to minimize or eliminate impacts to endangered species
A	**!**CWA 404	Wetlands/Section 404 of the CWA regulates the deposition of excavated material in the waters of the U.S., including wetlands.
R&A	**!**Florida Administrative Code 17-40E4	Surface water management standards administered by South Florida Water Management District
R&A	**!**Florida Administrative Code 17-3	General water quality criteria, groundwater classifications

A = APPLICABLE REQUIREMENTS WHICH WERE PROMULGATED UNDER FEDERAL LAW TO SPECIFICALLY ADDRESS A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION LOCATION OR OTHER CIRCUMSTANCE AT THE SITE.

R & A = RELEVANT AND APPROPRIATE REQUIREMENTS WHICH WHILE THEY ARE NOT "APPLICABLE" TO A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION, LOCATION, OR OTHER CIRCUMSTANCE AT THE SITE, ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT THE SITE THAT THEIR USE IS WELL SUITED TO THE SITE.

TABLE 6
POTENTIAL CHEMICAL-SPECIFIC AND ACTION-SPECIFIC ARARs

CLEAN WATER ACT - 33 U.S.C. 1251-1376

R & A 1,2	40 CFR Part 122-129: National Pollutant Discharge Elimination System 40 CFR 131 40 CFR 136	Requires permits for the discharge of pollutants for any point source into waters of the United States.
R & A 2	40 CFR Part 146	Technical criteria and standards for the UIC program. Class V well criteria and standards
A 1,2	CWA 402 (a)(1)	Effluent limitations are required to achieve all appropriate state water quality standards

SAFE DRINKING WATER ACT - 40 USC Section 300

R&A 1	40 CFR Part 141 - National Primary Drinking Water Standards	Establishes maximum contaminant levels (MCLs) which are health-based standards for public water systems.

HAZARDOUS MATERIALS TRANSPORTATION ACT - 49 U.S.C 1801-1813

A 2	40 CFR Parts 107, 171-179: Hazardous Materials Transportation Regulations	Regulates transportation of hazardous materials.

STATE ARARS

R & A 1	!Florida Administrative Code 17-610	Reuse of Reclaimed Water and Land Application. Buffer zone of approximately 50-100 feet between future potable well and existing land applications of reclaimed water areas. 50-100 feet sufficient for reclaimed water that does not require disinfection.
R & A 1	FAC 17-550.310	Florida primary drinking water standards
R & A 1,2	FAC 17-302.300	Antidegradation policy for surface water quality. Prohibits discharge of wastes into Florida waters without treatment to protect beneficial uses.
A 1	FAC 17-28	Regulations to control discharges to groundwater. Authorizes zone of discharge for facilities discharging to ground water as July 1, 1982.
A	FAC 17-4	Establishes procedures and requirements to obtain a permit from FDEP

TABLE 6
POTENTIAL CHEMICAL-SPECIFIC AND ACTION-SPECIFIC ARARs

A = APPLICABLE REQUIREMENTS WHICH WERE PROMULGATED UNDER FEDERAL LAW TO SPECIFICALLY ADDRESS A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION LOCATION OR OTHER CIRCUMSTANCE AT THE SITE.

R & A = RELEVANT AND APPROPRIATE REQUIREMENTS WHICH WHILE THEY ARE NOT "APPLICABLE" TO A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION, LOCATION, OR OTHER CIRCUMSTANCE AT THE SITE, ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT THE SITE THAT THEIR USE IS WELL SUITED TO THE SITE.

1 = CHEMICAL-SPECIFIC REQUIREMENT

2 = ACTION-SPECIFIC REQUIREMENT

!Long term effectiveness and permanence.

The groundwater alternatives, except for the no-action alternative, would all be effective and permanent in the long-term because they all involve actions to reverse the spread of the groundwater plume and to reduce the concentration of groundwater contaminants.

The wetland alternatives 3a and 3b offer the highest degree of long term effectiveness and permanence because they minimize disturbance of the existing Southwest Wetland. In addition, these alternatives remove the highest concentrations of metals in sediment which may pose a future threat to the wetland creatures that utilize the Southwest Wetland

The wetland alternatives 2a and 2b offer a lower degree of long term effectiveness and permanence because they increase the disturbance of the Southwest Wetland. These alternatives would remove all sediment with lead and zinc above their respective screening values, but would require reconstruction of a wetland environment throughout the Southwest Wetland.

With any of the wetland alternatives, except the no-action alternative, there is a degree of uncertainty associated with the long term health of reconstructed wetlands. However, the excavated areas would be graded and shaped in order to retain the water levels typical of a seasonal wetland. In addition, only native wetland vegetation would be replanted in the disturbed areas.

! Reduction of toxicity, mobility, or volume through treatment.

All the groundwater alternatives, except the no-action alternative, would reduce the mobility and volume of the groundwater contaminants through extraction of the contaminant plume. Groundwater alternative 3 involves treatment of groundwater through reverse osmosis to remove sodium and radium. Groundwater alternative 4 would offer some treatment through precipitation of radium during the spraying of groundwater. Alternative 2 includes chemical treatment and filtration to remove radium. Sodium levels would be dictated by the discharge point for the groundwater - either in a NPDES permit for a discharge to the Canal or as required by a third party user.

All the wetland alternatives, except for the no-action alternative, would reduce the mobility and volume of contaminated wetland sediment through excavation, solidification or disposal on the upland in OU1. Alternatives 2a and 2b would remove more contaminated sediment than alternatives 3a and 3b.

! Short term effectiveness

All of the groundwater alternatives, except for the no-action alternative, would be effective in the short term because they all involve extraction of the contaminated groundwater. Once the extraction wells were placed in operation, all the alternatives would begin to reverse the spread of plume. Alternative 3 requires the daily transportation of brine (the by-product of reverse osmosis) by one or two tanker trucks to the deep injection well located about 40 miles southeast of the Site.

Alternatives 2, 3, and 4 would have to function for 5 - 10 years before the cleanup levels were met. Alternative 4 would probably require 10 years of operation because the spray field discharge would not be operational during periods of excessive rainfall or when the groundwater level rose to within one foot of the ground surface (these limitations would prevent surface water runoff from leaving the spray field area, thus observing current hydrologic conditions at the Site).

The no-action alternative for groundwater can only be considered to be effective in the short term when you consider that there are no current drinking water wells in the immediate vicinity of the plume.

All of the wetland alternatives, except for the no-action alternative, would have some degree of short term effectiveness because they would address the metals contamination in sediment. However, alternatives 3a and 3b offer more short term effectiveness because the majority of the Southwest Wetland would not be disturbed.

! Implementabitity.

Groundwater alternative 2 may be difficult to implement because of issues pertaining to the discharge of the treated groundwater. A third party to accept the treated groundwater has not yet been identified. A discharge to the Canal would require permits from the State of Florida and the South Florida Water Management District.

Groundwater alternative 3 would depend on a long term contract with the owner/operator of the deep well injection facility. Otherwise, this alternative is technically straightforward. Groundwater alternative 4 would be least difficult treatment method to implement because the treated water would be discharged on-site in addition the spray field system could be installed in stages. A small system could be installed and operated to evaluate system performance with subsequent stages installed as necessary.

Wetland alternative 1, no action, would be the least difficult to implement since it only requires annual monitoring. Wetland alternatives 2a and 2b would be more difficult to implement than alternatives 3a and 3b because alternatives 2a and 2b would require the reconstruction and revegetation of virtually the entire Southwest Wetland.

- Costs

TABLE 7: COST COMPARISON OF CLEANUP ALTERNATIVES

GROUNDWATER ALTERNATIVES

Groundwater Alternative	Capital Costs	Annual Operation & Maintenance (O&M)/Years	Total Cost (based Present Worth)
1 - No Action	$ 48,000	$ 5,960/ 30 years	$ 150,800
2 - Treat for Radium, discharge groundwater off-site	$1,015,000	$349,500/ 5 years	$2,554,900
3 - Treat for Sodium and Radium, discharge groundwater on-site, dispose of treatment residue off-site	$ 630,000	$289,000/ 5 years	$1,903,400
4 - Blend Contaminated groundwater with clean water discharge on-site	$ 275,000	$ 83,000/ 10 years	$ 950,000

TABLE 7: COST COMPARISON OF CLEANUP ALTERNATIVES (cont.)

SOUTHWEST WETLAND ALTERNATIVES

Alternative	Capital Costs	Annual O&M Costs/Years	Total Costs (based on Present Worth)
1 - No Action	None	$3,500/ 30 years	$60,400
2a - Excavate All Contaminated Sediment, Revegetate, Solidify Some Sediment and Use Remainder On Areas Excavated During OU 1	$545,050	$7,500/ 5 years	$578,100
2b - Excavate All Contaminated Sediment, Revegetate, Dispose of Sediment in OU1 Landfill	$545,050	$7,500/ 5 years	$578,100
3a - Same as 2a Except that only Sediment with Highest Levels of Metals Would be Excavated	$278,650	$7,500/ 5 years	$311,700
3b - Same as 2b Except that Only Sediment With Highest Levels of Metals would be Excavated	$278,650	$7,500/ 5 years	$311,700

! State Acceptance.

The State of Florida, as represented by the Florida Department of Environmental Protection, has been the support agency during the Remedial Investigation (RI) and Feasibility Study (FS) process for Operable Unit Two (Groundwater and Wetlands) at this Site. FDEP, as the support agency, has provided input during this process in accordance with 40 CFR 300.430. Based on comments received from FDEP, it anticipated that written concurrence will be forthcoming; however, a letter formally recommending concurrence has not yet been received.

! Community Acceptance.

Based on the verbal and written comments, newspaper articles, and meetings with interested citizens, the community supports the proposed alternative. Five written comments were received during the public comment period. Those written comments expressed suppod for the proposed alternatives, Groundwater Alternative 4 and Wetland Alternative 3a. The most important factor behind the community support is that the groundwater alternative does not involve any off-site discharge. A previous EPA proposal for groundwater included the discharge of treated groundwater to the St. Lucie Canal, which was strongly opposed by the community.

During the public meeting, various questions were asked regarding the quality of the blended water, the timeframe for groundwater cleanup, and the amount of groundwater to be discharged to the sprayfield. Their questions were answered during the public meeting. Some citizens also inquired about the "loss" of clean groundwater as a result of blending the clean water with the contaminated groundwater. While some groundwater will be lost to evaporation during the spraying process the majority of the blended groundwater will be returned to the aquifer and will be available for future use. The blended groundwater will meet drinking water standards before it is discharged to the sprayfield.

8.2 Synopsis of Comparative Analysis of Alternatives

The groundwater alternatives, except for the no-action alternative, are similar in their level of protection for human health and the environment, compliance with ARARS, and long-term effectiveness. The implementability of the proposed groundwater alternatives differed and was a significant factor in the selection of the groundwater remedy. Groundwater alternative 4 was judged to be more implementable than the other action alternatives because the blended groundwater can be safely discharged on-site and is not dependent upon outside parties or off-site locations to accommodate the discharge.

The wetland alternatives, except for the no-action alternative, would protect human health and the environment and comply with ARARs. The long-term effectiveness and degree of compliance with Executive Order 11990 differed among the wetland alternatives and were the significant factors in the final selection of the wetland remedy. Wetland alternatives 3a and 3b include excavation of sediment in the upper portion of the Southwest wetland. Reducing the amount of excavation in the wetland will increase the likelihood of long-term health of the Southwest Wetland. In addition, the excavation will result in removal of almost all lead above its screening values and removal of the highest concentrations of zinc. A cleanup within the upper portion of the Southwest Wetland will provide a reasonable balance between reduction of contaminants and preservation of the highly functional wetland. This balance is one of the concepts set forth in the Executive Order 11990, Protection of Wetlands.

9.0 SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, EPA has selected a remedy for this site. At the completion of this remedy, the cancer risk associated with this Site will be in the range from 1x10-5 to 1x10-6 which is considered to be protective of human health and the environment.

The total present worth cost of the selected remedy, which includes groundwater alternative 4 and wetland alternative 3a, is estimated at $1,261,700. This includes capital costs of $ 553,650 and annual O&M costs of $ 90,500. The O&M costs would reduce to $83,000 after 5 years.

The groundwater cleanup includes extraction of groundwater, blending extracted groundwater with clean water from upgradient portion of the Site to meet federal and state MCLs, and disposal of the blended water through land application on an Upgradient on-site spray field. This portion of the cleanup is expected to cost approximately $950,000. The groundwater cleanup will probably operate for 10 years before cleanup levels are met.

The wetlands cleanup, for the upper portion of the Southwest Wetland, would include clearing existing vegetation, removal of contaminated sediment, and revegetation. Sediment with lead levels above 600 ppm would be solidified and disposed of in the on-site landfill (600 ppm is the minimum level which requires solidification as established for OU1); excavated sediment containing lead at concentrations lower than 600 ppm but above 160 ppm would be used as a soil additive for excavated upland areas on-site. Excavated sediment containing lead below the disposal standards would be used in the reconstruction of the upper portion of the Southwest Wetland. The wetland cleanup is expected to cost approximately $312,000 dollars.

A.   Groundwater Remediation

Groundwater remediation will include extraction of contaminated groundwater, blending with clean groundwater extracted from upgradient portions of the Site, and discharge of the blended groundwater via a spray field system established on the Site. The spray field discharge is expected to provide some treatment as radium is precipitated after spraying.

A.1. The maior components of groundwater remediation to be implemented include:

- Extraction of contaminated groundwater
- Blending groundwater with the contaminated groundwater so that federal and state MCLs are met
- Spray field discharge of the blended groundwater
- Compliance with ARARs listed in Tables 4 and 5 and this Section 9.

A.2. Extraction, Treatment, and Discharge of Contaminated Ground Water

Groundwater beneath and downgradient from the Site contains concentrations of sodium, radium and gross alpha which exceed either State or Federal primary drinking water standards.

As part of the selected remedy, the contaminated groundwater shall be extracted. The groundwater extraction well design and installation requirements will be finalized during the design phase. However, a preliminary design of the extraction well layout was included in the FS and should serve as a basis for further design of the extraction system.

New water supply wells shall be installed on upgradient portions of the Site. Clean water from these wells shall be introduced, via new injection wells, along the perimeter of the plume. This injected clean water will enhance the rate of plume removal and maintain water levels in the aquifer which will reduce possible negative impacts of a lowered water table on the nearby wetlands.

Clean water will then be blended with the extracted groundwater prior to application on the spray field. The estimated maximum size of this spray field is approximately 38 acres. Some radium will precipitate on land within the spray field during the spraying process. Soil sampling within the spray field will be conducted to confirm that contaminants do not accumulate at adverse levers due to the spraying process.

A.3.   Performance Standards

a. Extraction Standards

Groundwater at the Site which exceeds federal and State MCLs (listed in the following table) shall be extracted. However, it may become apparent during the operation of the groundwater extraction system that contaminants levels have ceased to decline and instead remain at levels higher than the extraction standards. In such cases, the system's performance may be re-evaluated by EPA.

Table 8: Groundwater Extraction and Discharge Standards

Groundwater Contaminant	Florida MCL	Federal MCL
Sodium, mg/l	160 mg/l	NA
Radium 226+228, pCi/l	5 pCi/l	5 pCi/l
Gross Alpha, pCi/l	15 pCi/l	15 pci/l

b. Treatment Standards

Contaminant concentrations in groundwater shall be reduced until federal and state MCLs are met. These MCLs are included in Table 8 - Groundwater Extraction and Discharge Standards.

c. Discharge Standards

Discharges from the spray irrigation system shall comply with all ARARs before the water is applied to the land. ARARs include the federal and state MCLs listed above and all effluent limits established by EPA or FDEP. If, during operation of the groundwater treatment system, it becomes apparent that discharge standards cannot be met, then EPA may re-evaluate other groundwater treatment methods.

The extraction and spray field systems shall not be operated during periods of excessive rainfall or when the water table rises to within one foot of land surface. This restriction is intended to control surface water runoff from the spray field so that overall surface water runoff from the Site does not exceed current runoff levels.

d. Design Standards

The design construction and operation of the groundwater treatment system shall be conducted in accordance with all ARARs, including the pertinent requirements set forth in 40 C.F.R. Part 264 (Subpart F). In addition, the system shall be designed and operated in a manner to avoid adverse impacts on the Southwest Wetland, nearby water supplies, or the contaminant plume.

B. Southwest Wetland

Remediation in the Southwest Wetland will address the metals contaminated sediment within the upper portion of the Southwest Wetland. The remediation will also address reestablishment of the disturbed portion of the Wetland including revegetation and maintenance of appropriate water levels within the disturbed portion of the Southwest Wetland.

B.1 Major components of Southwest Wetland remediation include:

a. Clear vegetation from northern 3.8 acres of the Southwest Wetland (area within the cleanup boundary)
b. Excavate the upper six inches of metals contaminated sediment within the cleanup boundary. Afterwards, excavate the remaining sediment and stockpile.
c. Backfill the excavated area with clean sand and previously excavated sediment which contains lead and zinc below their respective screening values. The upper portion of the backfill layer should consist of at least six inches of clean sediment. The area should be backfilled so that the resulting ground elevation are approximately 12 inches lower than the original ground elevations. This change in ground elevation is intended to establish water levels necessary to enhance survival of new wetland vegetation.
d. Revegetate the disturbed areas with native wetland vegetation in accordance with plans approved by EPA, FDEP,and Martin County.
e. Monitor and maintain the revegetated areas to promote regrowth and to remove exotic or nuisance species. This maintenance period shall last at least five years.

B.2 Treatment of excavated wetland sediment

Excavated wetland sediment which contains lead above 600 ppm would be solidified and disposed of in on-site landfill to be constructed as part of OU One. Solidification standards are the same as specified in the Record of Decision for OU One.

B.3 Performance Standards

The performance standards for this component of the selected remedy include, but are not limited to, the following standards:

a. Excavation Standards

Sediment located within the area between the FSC property line and a line approximately 700 feet southwest of and parallel to the property line shall be excavated (see Figures 4 and 5).

b. Treatment Standards

Excavated wetland sediment which contains lead above 600 ppm would be solidified and disposed of in on-site landfill to be constructed as part of Operable Unit One.

The solidified material shall meet the following standards (these are the same standards established for Operable Unit One and are repeated here for clarity):

- TCLP extract (mg/l)

Cadmium	.2 - 2
Chromium	.5 - 6
Lead	.1 - 3
Nickel	.5 - 1

- Permeability between 10-5 and 10-6** cm/sec
- Unconfined compressive strength greater than or equal to 50 pounds per square inch (psi).
- A diffusion index for lead equal to or greater than 12 as determined by the American Nuclear Society (A.N.S.) 16.1 leach test procedure.

c. Disposal standards

Excavated sediment from the Southwest Wetland which contains lead less than 600 ppm but higher than 160 ppm would be added To soil in upland areas excavated as part of Operable Unit One. Such use of the sediment is intended to promote the growth of grass or other ground cover in order to limit erosion from the excavated areas.

Excavated sediment containing lead below 160 ppm would be further evaluated during the Remedial Design to determine how much of the sediment can be reused in reconstruction of the Southwest wetland. The Florida PEL for lead in sediment is 160 ppm and this value will be used as a screening value to determine the need for further evaluation of the sediment with respect to ecological effects.

C. Compliance Testing

Monitoring shall be conducted to document the quality of groundwater, blended water, wetland sediment, and surface water. An appropriate sampling and analysis plan shall be prepared during the RD/RA. The sampling plan will address, at a minimum, the contaminants listed below in Table 9.

Table 9: Groundwater Compliance Monitoring

Groundwater Contaminant	Florida MCL	Federal MCL
TIER 1*:		
Sodium, mg/l	160 mg/l	NA
Radium 226+228, pCi/l	5 pCi/l	5 pCi/l
Gross Alpha, pCi/l	15 pCi/l	15 mg/l
TIER 2:		
Cadmium	.005 mg/l	.005 mg/l
Lead	.015 mg/l	.015 mg/l
Benzene	.001 mg/l	.005 mg/l
Tetrachloroethene	.003 mg/l	.005 mg/l
Vinyl Chloride	.001 mg/l	.002 mg/l

*Tier 1 contaminants represent the majority of the overall existing groundwater contamination and shall be monitored on a periodic basis. The organic compounds in Tier 2 were detected sporadically in a limited number of wells on-Site during the most recent sampling event. Cadmium and lead were detected above standards in years past, but were not present above standards during the last three sampling events in 1992 and 1993. Therefore, the Tier 2 contaminants can be monitored less frequently than Tier 1 contaminants.

A long term monitoring system shall be implemented to monitor the progress of groundwater remediation and the effectiveness of continued operation of the groundwater treatment system. After demonstration of compliance with groundwater Performance Standards, the groundwater shall be monitored for at least five years. If monitoring indicates that the Performance Standards set forth in Paragraph A.3 are being exceeded at any time after pumping has been discontinued, extraction and treatment of the ground water may recommence until the Performance Standards are once again achieved.

Treated groundwater will also be monitored on a regular basis to ensure that the treated water meets the necessary discharge standards. Discharge standards include those standards listed in Table 7 - Groundwater Extraction and Discharge Standards. In addition, soil sampling within the spray field shall be conducted to confirm that contaminants do not accumulate at adverse levels due to the spraying process.

A long term monitoring and management system shall be implemented to evaluate the effectiveness of the wetland cleanup and shall have a duration of at least five years.

Initial wetland sediment sampling shall be conducted to verify that sediment which remains within the upper portion of the Southwest Wetland does not exceed the disposal standards described in Section 9.B.3.c. Subsequent wetland sediment sampling and tissue sampling may be necessary to fully evaluate the effectiveness of the cleanup.

Surface water sampling shall also be conducted to document the quality of surface water which flows from the FSC property into the Southwest Wetland. The sampling is intended to ensure that actions taken as part of OU 1 minimize or eliminate exceedances of Florida Surface Water Quality Standards or federal Ambient Water Quality Criteria in the Southwest Wetland.

The excavated portion of the Southwest Wetland shall be monitored and managed for a period of at least 5 years after replanting to promote regrowth and to remove exotic species.

10. STATUTORY DETERMINATIONS

EPA has determined that the selected remedy will satisfy the statutory determinations of Section 121 of CERCLA. The remedy will be protective of human health and the environment, will comply with ARARs, will be cost effective, and will use permanent solutions and alternative treatment technologies to the maximum extent practicable.

Furthermore, the regulatory preference for treatment as a principal element and the bias against off-site land disposal of untreated wastes are satisfied to the extent practicable.

10.1 Protection of Human Health and The Environment

The groundwater treatment component of the selected remedy will protect human health and the environment by reducing or preventing further migration of the contaminated groundwater and by reducing the contaminant concentrations in groundwater until the concentrations are less than or equal to MCLs. Compliance with MCLs will reduce the longterm cancer risk associated with possible ingestion of the groundwater to the range between 1x10-5 and 1x10-6. Penodic groundwater monitoring will be conducted to evaluate the performance of the groundwater treatment system.

Cleanup within the upper portion of the Southwest wetland, will remove almost all lead concentrations above biological effects levels and remove the highest concentrations of zinc. Zinc concentrations decrease significantly in the lower portion of the Southwest Wetland which marks the approximate beginning of the herbaceous portion of the wetland. This cleanup within the upper portion of the Southwest Wetland will provide a reasonable balance between reduction of contaminants and preservation of the highly functional wetland.

10.2 Compliance with ARARs

Implementation of this remedy will comply with all Federal and State ARARs and will not require a waiver.

The groundwater extraction and treatment system will meet the groundwater performance standards noted in Section 9.A.3, which are based on Federal and State MCLs. Federal and State MCLs are considered relevant and appropriate in the cleanup of contaminated groundwater. MCLs will be met with respect to the discharge of treated groundwater. The cleanup of the Southwest Wetland will comply with state and federal ARARs and Executive Order 11990. A long-term monitoring program will be implemented to assess the progress and effectiveness of the cleanup.

10.3 Cost-Effectiveness

The selected remedy, which combines Groundwater Alternative 4 and Wetland Alternative 3a, is a cost effective remedy. The total estimated present worth cost of this alternative is approximately $1,261,700, which includes capital costs and annual operation and maintenance costs. EPA has determined that the cost of implementing the remedy is proportionate to the overall effectiveness of the remedy.

10.4 Use of Permanent Solutions and Treatment Technologies

The selected remedy uses permanent solutions and treatment technologies to the maximum extent practicable, given Site-specific considerations and limitations. Groundwater extraction and treatment will involve measures to reduce the mobility and volume of contaminants in groundwater. Solidification of contaminated sediment will insure a permanant reduction in the mobility of the contaminants.

10.5 Preference for Treatment as a Principal Element

The selected remedy includes treatment by solidification for wetland sediment containing the highest levels of metals. A portion of the excavated sediment, which contains lower levels of lead and zinc, will be used as a soil additive for upland areas excavated during OU1. The sediment will aid in the growth of a ground cover for those areas to be excavated as part of OU1. Such use of a portion of the sediment was judged to be more beneficial than satisfying a preference for treatment of all excavated material.

The groundwater remedy includes blending the contaminated groundwater with clean water prior to land application in the spray field. The sprayed water will meet groundwater standards at the time of spraying.

There are unique Site-specific considerations that support the selected groundwater remedy at this Site. Sodium constitutes the primary contaminant, by mass, in the contaminant plume. Radium, the only groundwater contaminant which exceeds federal MCLs, was not used in the primary operations of the former steel mill. Rather, its presence is due to operation of the mill's water softening system. The water softener was periodically backflushed; this backflush contained elevated levels of sodium and was discharged to the ground. Low levels of radium in groundwater may have been concentrated in the water softener and discharged in the backflush.

The presence of sodium dictates the use of a limited number of treatment methods such as reverse osmosis. Reverse osmosis generates a concentrated waste brine which requires proper disposal. It was not cost effective to dispose of the brine on-site; the cost to construct an on-site deep injection well for such disposal was estimated to be between 2-3 million dollars. The nearest existing suitable deep injection well is located almost 40 miles away and would require daily transport of between 5,000 and 10,000 gallons of brine from the Site to the deep well.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

The remedy described in this Record of Decision is the preferred alternative described in the Proposed Plan for this Site. There have been no significant changes in the selected remedy.

APPENDIX A
RESPONSIVENESS SUMMARY
FLORIDA STEEL NPL SITE - OPERABLE UNIT TWO
INDIANTOWN, FL

PART I: Summary of Public Comment

A public meeting was held on March 3, 1994, at the Indiantown Middle School. 14 people attended the meeting including nearby residents, newspaper reporters from the Stuart News and Palm Beach Post, and representatives from the Martin County Health Department and FDEP. Questions posed by the audience were answered during the meeting and the audience was generally supportive of EPA's Proposed Plan which included Groundwater Alternative 4 and Wetland Alternative 3a.

One comment that may need an additional response was in regards to the potential "loss" of clean groundwater as a result of blending the clean water with the contaminated groundwater. While some groundwater will be lost to evaporation during the spraying process, the majority of the blended groundwater will be returned to the aquifer and will be available for future use. The blended groundwater will meet drinking water standards before it is discharged to the sprayfield.

The public comment period was held from February 18 through March 19. Five responses were submitted by the general public during this time. The responses generally expressed support for EPA's Proposed Plan, though two citizens suggested wetland alternative 3b. The sentiment of recent public comments is in contrast to public comments received in April 1992 when EPA proposed that treated groundwater be discharged to the St. Lucie Canal. The community was strongly opposed to any discharge to the St. Lucie Canal.

The Florida Department of Environmental Protection (FDEP) also submitted comments which were generally supportive of EPA's proposal. FDEP asked for assurances that if the groundwater remedy does not meet performance standards, that other alternative methods be implemented.

PART II: Comments and Responses

1. Who will pay for this cleanup?

RESPONSE: Florida Steel Corporation is responsible for conducting and paying for this cleanup. Florida Steel has paid for all the monitoring and previous cleanup activities at the Site and has repaid EPA over $300,000 for EPA's cost for oversight and review of site activities.

2. We suggest groundwater alternative 4 and wetland alternative 3b.

RESPONSE: Groundwater alternative 4 is EPA's proposal for groundwater cleanup. EPA appreciates support for the proposal.

Wetland alternative 3b differs slightly from EPA's proposal, Wetland alternative 3a. Wetland alternative 3b does not allow any excavated sediment to be used on the Florida Steel property; instead all excavated sediment above cleanup standards would be placed in the planned on-site double lined landfill. Wetland alternative 3a includes solidification and disposal of sediment in the on-site landfill plus the disposal of some of the excavated sediment on parts of the Florida Steel property where a separate soil excavation and solidification will take place. This use of sediment would promote the growth of grass cover in those areas to be excavated and would thus reduce the potential for erosion.

3. We fully support the Preferred Alternative listed on page 10 of the Proposed Plan.

RESPONSE: EPA appreciates support for the Preferred Alternative which includes groundwater alternative 4 and wetland alternative 3a.

4. I am disappointed that the Proposed Plan dated February 1994 did not give more attention to the solidification and disposal of contaminated soil in the planned on-site landfill. Also, I hope that the

costs of maintaining the landfill are paid by Florida Steel and not by Superfund tax dollars.

RESPONSE: The solidification and disposal of contaminated soil in an on-site landfill was fully described in the April 1992 Proposed Plan and the associated public meeting and public comment period. This proposal was finalized in June 1992 (this information is contained in the administrative record at the Indiantown Library). The double lined landlill will contain only material that has been solidified as part of the soil cleanup and the sediment cleanup. After the solidification process is completed, the landfill will be covered and closed.

The cleanup of contaminated soil on the Florida Steel site is currently in the design phase; initial construction could begin by December 1994.

Florida Steel is responsible for paying all costs associated with the cleanup, including maintenance of the landfill and EPA's expenses associated with oversight of the cleanup.

5.   I hope that efforts to contain the movement of contaminated groundwater and surface water will begin soon.

RESPONSE: The cleanup of contaminated soil, which should begin by the end of 1994, will minimize or eliminate the presence of metals in surface water runoff. The groundwater cleanup, including installation of groundwater extraction wells and associated piping, will probably start in mid-1995, after completion of the soil cleanup. Such a schedule will help avoid damage to groundwater extraction wells and associated piping that could be damaged by the movement of heavy equipment during the soil cleanup.